Variations in CHD Mortality in England Predominantly Explained by Population Characteristics

Levene LS, Baker R, Bankart MJG, Khunti K. Association of features of primary health care with coronary heart disease mortality. JAMA 2010;304:2028–34.

Study Overview

Objective. To identify which features of populations and primary health care explain variations in age-adjusted coronary heart disease (CHD) mortality rates.

Design. A cross-sectional design using multivariate analyses.

Setting and participants. The study used data from 152 primary care populations in England (primary care service areas are grouped geographically into 152 "trust areas"). A variety of primary care service attributes and population characteristics were available for each trust area. The age-adjusted CHD rates 2006 through 2008 in each trust area was the dependent variable. The independent variables examined as predictors of the CHD rate included population characteristics (eg, ethnicity, lifestyle-related indicators such as smoking and obesity, socioeconomic deprivation [calculated by the UK government for each trust incorporating indicators such as employment levels, education characteristics, and crime rate]) and primary care service characteristics (eg, primary care staff per 100,000 population, level of provision of primary care services, pay for performance data [ie, indicators for hypertension, CHD, and diabetes]). One of the performance indicators for each of the primary care service areas was the proportion of patients with hypertension or CHD whose most recent blood pressure measurement was < 150/90 mm Hg or whose cholesterol level was < 192.99 mg/dL in the last 9 months.

Main outcome measure: Age-adjusted CHD mortality rates in each year 2006–2008.

Main Results: The univariate (1 predictor) regression models indicated that the socioeconomic deprivation index explained the highest proportion of variance in the age-adjusted CHD mortality rate (47%) when considered as an individual predictor. The smoking rate explained the second highest proportion of the variance when considered individually (34%). The obesity rate explained 11% of the variance in CHD mortality rates when considered individually. Other variables showed lower levels in explaining variance in CHD rates. Among the lowest level of variance explained was proportion of patients with hypertension whose blood pressure was controlled (0.002% of variance explained).

Variables that individually showed a statistically significant relationship and which were not associated with other variables were identified and described for each of the 4 quarters of 2008, with only minor variation observed between quarters. Hierarchical regression models were calculated for each of the 3 study years to assess the impact of primary care service indicator variables being added to the model after other patient population characteristics were in the model. The only significant finding related to the primary care service indicators was that the level of hypertension (prevalence) in the population was negatively associated with CHD mortality. In other words, as the level of hypertension detection increased, the rate of CHD mortality decreased ($P < 0.001$). The prevalence of hypertension explained about 7% more of the variance when added to each yearly model.

Commentary

The authors sought to use data available for each geographic area to gain insights about the impact of primary care service

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attributes on the outcome indicator, age-adjusted CHD mortality. They found that higher proportions of white individuals, higher levels of deprivation, higher levels of diabetes, higher proportions of smokers, and lower levels of detected hypertension were associated with higher levels of CHD mortality at the primary care trust level.

The study's finding related to detection of hypertension in the primary population is important and does correspond with the known value of early detection of treatable disease. Ritz [1] indicates that only about 25% of patients with high blood pressure control are adequately controlled; thus, greater attention to both detection and appropriate treatment in primary care settings is worthy of greater focus and implementation.

This study was technically well done, although the sample size was quite low for the use of multivariate analyses. There are several other weaknesses to the study, which were detailed by the authors. First, at most only 68% of the variance in CHD mortality rates was explained; this indicates that important predictors of CHD mortality rates may not have been included in the analyses. For example, no mention was made about indicators of dietary intake; studies have shown that that composition of foods in the diet can influence CHD risk [2]. Second, the dependent and the predictor variables were from the same time period. From a natural history of disease perspective, it would not be expected that current primary care and population characteristics would necessarily predict current cardiovascular mortality rates. Third, trust-level primary care indicators mask variation that may be occurring between high and low performing practices within a particular trust area. Fourth, assessment of population-level relationships may not accurately reflect the relationship between quality of care at an individual level and an individual's health states related to morbidity or mortality.

In addition, using the outcome of mortality to assess theimpact of clinical performance is a questionable choice. A more direct measure of clinical care impact might be a utilization indicator, such as the need for cardiovascular inpatient or emergency care. Mortality is a more distant outcome and more weakly linked to the quality of primary care being provided for high blood pressure. There are often other intermediate health status events that occur prior to death, and these events should also be assessed when evaluating the impact of primary care quality.

Although this study suggests that primary care performance has a limited impact on mortality, practicing clinicians are advised to question the use of geographic area–level data to evaluate the impact quality indicators on health outcomes. For example, given the clear evidence about the importance and effectiveness of hypertension treatment [3–5], the lack of impact from primary care service seen in this study does not have relevance for the individual care of the hypertensive patient. Evaluation of the impact of primary care quality indicators is best done when it considers the particular population that the primary care physician is responsible for managing. The role of patient adherence to treatment recommendations is also a factor and should be assessed when examining health status outcomes at an individual or population level [5,6].

Applications for Clinical Practice

The multivariate analyses presented in this study show that socioeconomic factors and smoking status are important predictors of age-adjusted CHD mortality rates. Programs to reduce mortality need to address the health characteristics of populations and provide interventions that improve population health.

—Review by Martin MacDowell, DrPH, MBA, MS

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